



A DOVER COMPANY

**Automation**  
**Robohand FERGUSON**  
**CAMCO**

## **SERVICE MANUAL**

**CAMCO RSD Rotary Servo Drive**  
**115RSD**

# TABLE OF CONTENTS

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INTRODUCTION .....	2
WARNINGS AND CAUTIONS .....	2
SPARE PARTS KIT .....	2
BEFORE STARTING .....	2
DISASSEMBLY .....	3
GENERAL .....	3
SERVO MOTOR REMOVAL .....	3
BOTTOM COVER AND LUBE REMOVAL .....	3
FOLLOWER WHEEL REMOVAL .....	3
INSPECTION OF CAM FOLLOWERS .....	3
FOLLOWER REMOVAL .....	3
FOLLOWER WHEEL BEARING REMOVAL .....	4
INPUT SHAFT/CAM REMOVAL .....	4
BEARING CARTRIDGE DISASSEMBLY .....	4
ASSEMBLY .....	5
PRIOR TO REASSEMBLY .....	5
INPUT SHAFT/CAM REASSEMBLY .....	5
FOLLOWER WHEEL REASSEMBLY .....	5
FOLLOWER WHEEL INSTALLATION .....	6
BEARING CARTRIDGE REASSEMBLY .....	6
SETTING INPUT SHAFT/CAM BEARING PRELOAD .....	6
SETTING THE CAM .....	7
OIL SEAL INSTALLATION .....	8
LUBRICATION .....	8
BOTTOM COVER INSTALLATION .....	8
SEAL INSTALLATION .....	8
SERVO MOTOR INSTALLATION .....	8
HOW TO ORDER PARTS .....	9
REQUIRED INFORMATION .....	9
TO ORDER PARTS .....	9
WARRANTY/NON-WARRANTY REPLACEMENT .....	9
115RSD ASSEMBLY DRAWING .....	10
115RSD PARTS LIST .....	11-13

# INTRODUCTION

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This service manual pertains to the disassembly and assembly of CAMCO's RSD servo mechanical drive MODEL 115RSD.

The manual is to be used in conjunction with the General Service Manual which describes the lubrication and general maintenance of CAMCO Index Drives.

An exploded view illustration of the index drive is included in this manual. The procedures in this manual reference the item numbers of this illustration.

Also included is a complete Parts List for your convenience in identifying and ordering spare or replacement parts.

Some users of index drives have the facilities and trained personnel to accomplish service repair. You must determine the extent to which intricate servicing should be done in your facility. When in doubt, CAMCO recommends that CAMCO trained servicemen make the repairs.

## WARNINGS AND CAUTIONS

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Statements in this manual preceded by the words **WARNING** or **CAUTION** and printed in italics are very important. We recommend you take special notice of these during service or repair.

### ***WARNING***

Means there is the possibility of personal injury to yourself or others.

### ***CAUTION***

Means there is the possibility of damage to the CAMCO unit.

## SPARE PARTS KIT

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CAMCO offers a Spare Parts Kit for all CAMCO index drive models CAMCO builds. These kits include bearings, shims and cam followers. These are components that will most likely require replacement during repair of your index drive.

A complete list of components supplied in the Spare Parts Kit can be found in the Bill of Materials in this manual. An asterisk behind the item number indicates that the part is supplied with the Spare Parts Kit.

## BEFORE STARTING

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Before starting disassembly of your CAMCO unit, you should read and review the following instructions. These provide important information on parts and procedures necessary to successfully complete your repair.

NOTE: Numbers in these instructions refer to the Assembly Drawing on page 10 and the Parts List on pages 11-13.

Comply with all Warnings and Cautions.

Read the "Trouble Shooting Guide" section of your General Service Manual before disassembling CAMCO units. CAMCO recommends returning defective equipment for inspection and repair whenever possible.

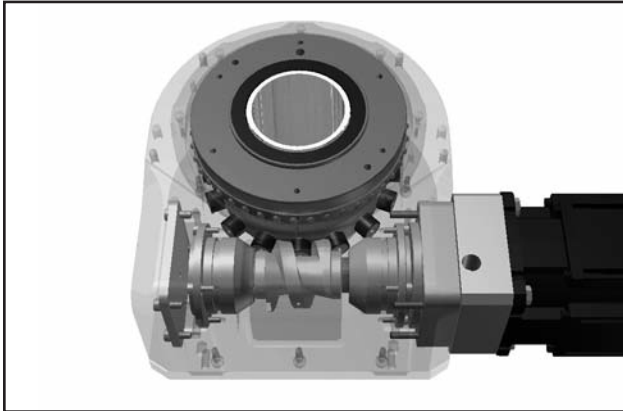
CAMCO uses PermaBond® adhesive to secure all screws and setscrews. If you encounter a fastener that is difficult to remove, apply heat to the screw and remove while still warm.

# DISASSEMBLY

## GENERAL

Remove all accessory equipment such as clutches, reducers, and sprockets.

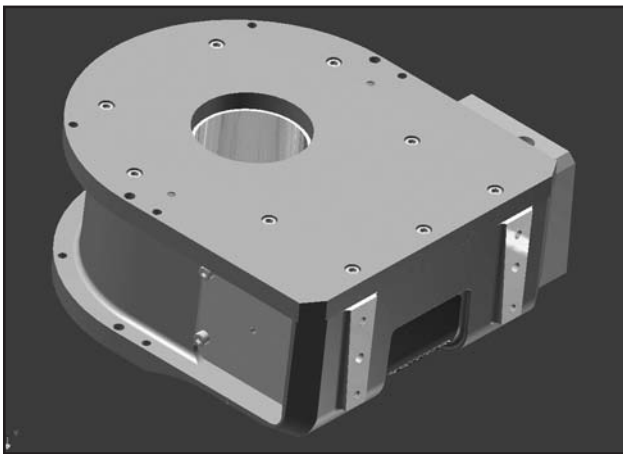
## SERVO MOTOR REMOVAL



*Fig. 1 Servo motor removal*

- A. Loosen the screws (23) of servo motor adapter (22).
- B. Remove screws (23), servo motor, and shaft collar (13) from input shaft.

## BOTTOM COVER AND LUBE REMOVAL



*Fig. 2 Bottom cover and lube removal*

- A. With housing (1) turned upside down, remove screws (1a) and dowel pins (1b) and bottom cover.
- B. Flush entire unit with a solvent to remove grease from cam compartment.

## FOLLOWER WHEEL REMOVAL

- A. Remove output bearing retainer (6) and shims (5) from housing (1).

NOTE: Keep shims with retainer. You will be asked to reinstall or replace with the same shim thickness during assembly.

- B. Remove quad seal (27) from output bearing retainer (6).
- C. Remove follower wheel (4) from housing (1).
- D. Remove shims (5) from housing (1).

NOTE: Keep shims with follower wheel. You will be asked to reinstall or replace with the same shim thickness during assembly.

## INSPECTION OF CAM FOLLOWERS

Inspect cam followers (25) for damage or radial looseness. Looseness should not exceed 0.001 inch. Do not confuse radial looseness with axial endplay. Endplay will be between 0.03 and 0.06 inch as a normal condition. If it exceeds 0.06 inch, it may require replacement.

NOTE: Generally, cam followers are replaced as added insurance against eventual failure.

## FOLLOWER REMOVAL



*Fig. 3 Follower removal*

- A. Apply heat to setscrews (31) and remove the setscrews while still warm.
- B. Turn the follower wheel (4) over to remove steel balls.
- C. Threaded holes have been provided in the ends of the follower (25) for ease of removal. Use a

slide hammer or simple self-made pull tool. The self-made tool consists of a short piece of round tubing large enough to clear the follower diameter and a small flat bar with a clearance hole large enough to insert a capscrew of equal thread size as the follower pull hole. Slip the tube over the follower, place the bar over the tube, and thread the capscrew into the follower. Tightening the capscrew will remove the follower.

- D. Check the follower holes for roundness. These holes may be elongated due to overloads and jams.

## FOLLOWER WHEEL BEARING REMOVAL

- A. Remove all the followers (25) as described in the last section.
- B. Apply heat to screws (28) and remove the screws with washers (24) while still warm.
- C. Remove bearing (3) from follower wheel (4).

## INPUT SHAFT/CAM REMOVAL

- A. Rotate the input shaft (15) and inspect all parts for wear or damage. Endplay in the input shaft is not permissible.
- B. Match mark cartridges (11, 12) relative to the housing (1). These must be reinstalled in the same side and position since they are eccentric.
- C. Remove the pull dowels (29b) from both bearing cartridges (11, 12).
- D. Remove four screws (29a) from first cartridge (11).
- E. Tap on the opposite end of the input shaft (15) to loosen bearing cartridge (11). Remove the cartridge and shims (5).

NOTE: Keep shims with bearing cartridge. You will be asked to reinstall or replace with the same shim

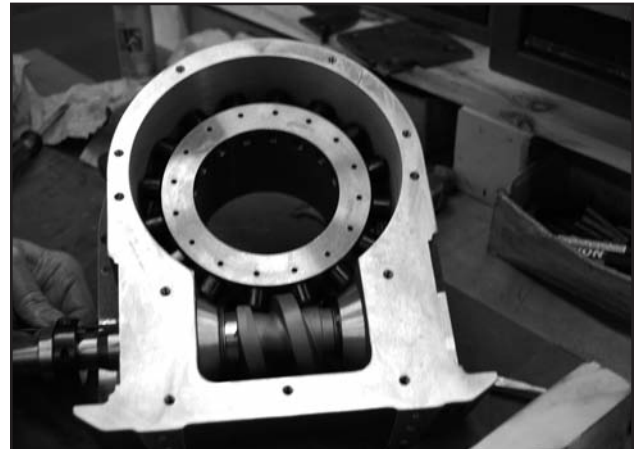
thickness during assembly.

- F. Remove four screws (29a) from second cartridge (12).
- G. Tap on the opposite end of the input shaft (15) to loosen bearing cartridge (12). Remove the cartridge and shims (5).

NOTE: Keep shims with bearing cartridge. You will be asked to reinstall or replace with the same shim thickness during assembly.

- H. Remove input shaft (15) with cam (16) from housing (1). If either the input shaft or cam need to be replaced, replace both items.
- I. Remove bearing washers (24) and thrust bearing (18) from input shaft (15).

## BEARING CARTRIDGE DISASSEMBLY



*Fig. 4 Bearing cartridge disassembly*

- A. Use a puller to remove bearing from bearing cartridges (11, 12).
- B. Remove o-ring (10) from bearing cartridges (11, 12).

## ASSEMBLY

### PRIOR TO ASSEMBLY

- A. Clean and deburr all parts before reassembling.
- B. Follow tightening torque and Permabond recommendations as outlined in the General Service Manual.

### INPUT SHAFT/CAM REASSEMBLY

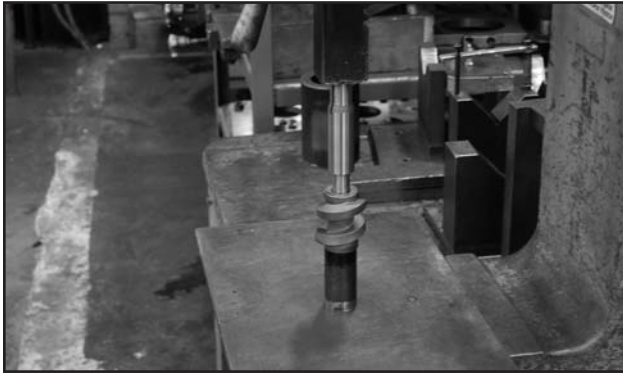


Fig. 5 Input shaft/cam reassembly

- A. Apply anti-seize lubricant to the end of the shaft (15) with the smaller diameter.
- B. Heat cam (16) to 250 degrees prior to installation.
- C. Place cam (16) on an arbor press and press shaft (15) in until bottomed.
- D. Place cam (16) on its side until cool to the touch.

### FOLLOWER WHEEL REASSEMBLY



Fig. 6 Follower wheel reassembly

- A. Apply anti-seize lubricant to both follower wheel (4) and bore of the bearing (3).
  - B. Using an arbor press and adaptor fixture, press bearing (3) onto the follower wheel (4) until it is seated. Heat may be applied to bearing if necessary.
  - C. Check cam followers (25) to make sure they spin freely.
  - D. Install capscrews (28) with washers (24) using Permabond thread-locking liquid adhesive as recommended in the General Service Manual.
- CAUTION: Be sure to press the follower in straight, as damage to the follower and follower wheel could occur if improperly aligned during installation.*
- E. Use these steps to install the cam followers:

1. Remove shipping o-ring from the stud of cam follower (25). This o-ring is used only to hold cam follower together.
2. Apply anti-seize lubricant to holes in follower wheel (4).
3. Cam followers require use of an insertion gage CAMCO Part Number 99A73565000000 for proper installation.
  - a. Place insertion gage CAMCO Part Number 99A73565000000 around cam follower (25).
  - b. Press cam follower (25) onto follower wheel (4) to the position prescribed by the gage. If pressed too far, the follower will not turn freely.
4. Install setscrews (31) using Permabond thread-locking liquid as recommended in the General Service Manual.
5. Install remaining followers (25) in the same manner.



## FOLLOWER WHEEL INSTALLATION



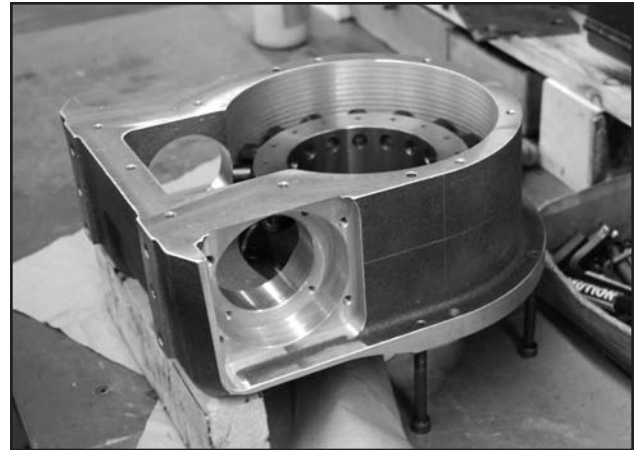
*Fig. 7 Follower wheel installation*

- A. Loosen either cartridge (11, 12) so that follower wheel (4) has a small amount of play.
- B. Position housing (1) on a work bench with opening for cover facing up. Create temporary legs with screws to hold housing.
- C. Install shims (5) in housing (1). It is preferable to install the same shims that were removed from the housing during disassembly; if that is not possible, use shims of equivalent thickness.
- D. Insert follower wheel (4) down through opening of housing (1).
- E. Apply a bead of white silicone on the surface where output bearing retainer (6) will rest.
- F. Install output bearing retainer (6) with shims (2). It is preferable to install the same shims that were removed during disassembly; if that is not possible, use shims of equivalent thickness.
- G. Install and tighten capscrews (29a).
- H. Tighten cartridges (11,12).

## BEARING CARTRIDGE REASSEMBLY

- A. Coat the outside of bearing and bore of the bearing cartridges (11, 12) with anti-seize lubricant.
- B. Using an arbor press, install bearing into bearing cartridges (11, 12). The rounded edge of bearing should be pressed into cartridge.

## SETTING INPUT SHAFT/CAM BEARING PRELOAD



*Fig. 8 Setting input shaft/cam bearing preload*

- A. Position housing (1) on a work bench with opening for bottom cover facing up. Create temporary legs with screws to hold housing.
- B. Apply EXP 222 grease to bearings (18, 19, 20 and 21).
- C. Install first cartridge (11) into the same side and position as disassembled. It is preferable to install the same shims that were removed during disassembly; if that is not possible, use shims of equivalent thickness.
- D. Install and tighten screws (29a).
- E. Insert input shaft (15) into housing (1) so that shaft orientation is the same as before disassembly.
- F. Apply EXP 222 grease in bearing.
- G. Install second cartridge (12) in the same position as disassembled. It is preferable to install the same shims that were removed during disassembly; if that is not possible, use shims of equivalent thickness.
- H. Install and tighten screws (29a).
- I. Rotate shaft (15) and check preload. There should be no endplay and a small amount of drag should be felt from preloading bearings—add or remove shims (14) as necessary to obtain this condition. In rare instances, it may be necessary to machine the cartridge if all shims have been removed and endplay still exists.

NOTE: The same amount of shims should be added or removed from both cartridges.

## SETTING THE CAM

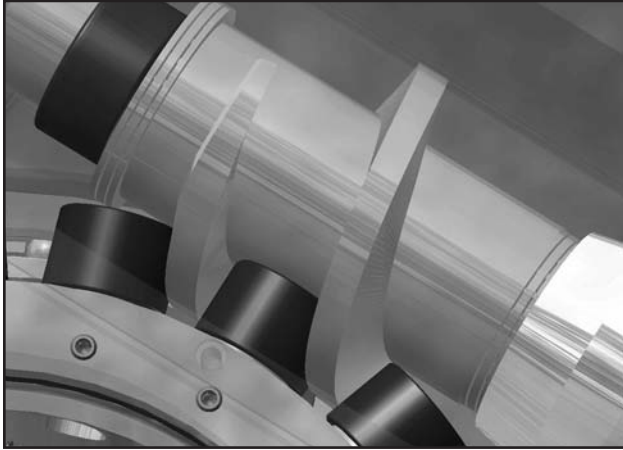


Fig. 9 Setting the cam

**CAUTION:** This mechanism is designed to operate with adjacent followers in close contact along their entire width with the surface of the cam. Unless this condition is achieved by proper installation, the mechanism will not transmit its rated load. Serious damage to the cam and output shaft will occur.

A. Apply Permatex Prussian Blue sealant to entire cam (16) track.

**IMPORTANT:** The following procedure is very important and can be difficult if not performed by a trained and experienced service technician.

B. Rotate input shaft (15) slowly with a small hand crank to ensure that:

1. Both followers are in contact with cam rib. Look for the removal of all bluing in equal amounts on both sides of cam. If bluing removal is uneven, loosen screws (29a) on both cartridges (11 and 12) and rotate tops of cartridges (11, 12) until followers (25) are in contact. Tighten screws (29a).
2. You should not encounter unusual resistance in motion. The bluing pattern should be removed evenly on either side of the cam rib or tooth. If the patch of bluing is worn off the outside of the cam rib on one side of the cam (16) and not the other, remove cartridges (11, 12) and shift shims (14) from one cartridge to the other so that the cam is shifted 0.002 to 0.005 inches in the direction of the worn side. Do not overshift cam (16) or knocking will occur.
3. There should be no looseness or backlash of the output shaft or flange at any point of the rotation. If there is, loosen screws (29a) on

both sides and rotate tops of cartridges (11, 12) to slightly preload the loosest dwell. Tighten screws (29a) on both sides.

4. Rotate the shaft (15) for one full turn of the output shaft. You should feel a constant torque or effort to turn the shaft. If there is not, remove follower wheel (4) and adjust shims (14) to move follower wheel in or out.

C. Match mark cartridges with housing to retain proper adjustment.

D. Final assemble as follows:

1. Remove screws (1a).
2. Remove output bearing retainer (6) and shims (2) from housing (1).

**NOTE:** Keep shims with output bearing retainer.

3. Remove follower wheel (4) from housing (1).
4. Remove shims (5) from follower wheel (4).

**NOTE:** Keep shims with follower wheel.

5. Remove first cartridge (11) and shims (14).
6. Lightly grease and install o-ring (10) on cartridge (11).
7. Install shims (14) on cartridge (11).
8. Apply EXP 222 grease on o-ring (10) and its mating surface on housing (1).
9. Remove second cartridge (12) and shims (14).
10. Install o-ring (10) on cartridge (12).
11. Install shims (14) on cartridge (12).
12. Apply EXP 222 grease on o-ring (10) and its mating surface on housing (1).
13. Install cartridge (11, 12), install screws (29a), align match marks to obtain proper cam setting, tighten screws.
14. Install roll pins (29b).
15. Hand pack bearing (3) with EXP 222 grease. Wipe off excessive grease.
16. Install seal ring (9) in groove of follower wheel (4).
17. Apply EXP 222 grease on seal ring (9) and



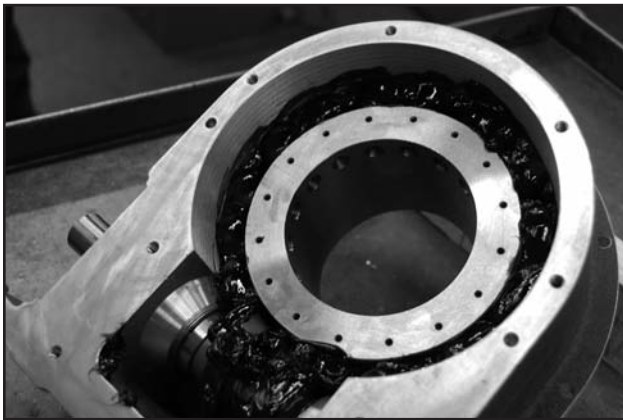
its mating surface on center post (7).

18. Install shims (5) in housing (1).
19. Insert follower wheel (4) down through opening of housing (1).
20. Install quad ring (27) in groove of output bearing retainer (6).
21. Apply EXP 222 grease on quad ring (27) and its mating surface on follower wheel (4).
22. Apply a bead of silicone around follower wheel opening of housing (1).
23. Install shims (5) on housing (1).
24. Apply a bead of silicone under output bearing retainer (6).
25. Install output bearing retainer (6).
26. Install screws (32) using Permabond thread locking liquid as recommended in the General Service Manual.
27. Wipe off all excess silicone.

## OIL SEAL INSTALLATION

Install new oil seal as described in the General Service Manual.

## LUBRICATION



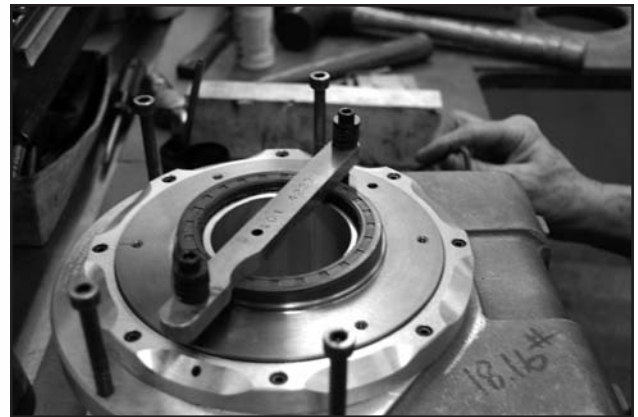
*Fig. 10 Lubrication*

With housing (1) upside down, fill housing with 16 oz. of EXP 222 grease, so that grease is level with top of cam followers (25).

## BOTTOM COVER INSTALLATION

- A. Install two dowel pins (1b) in the cover for alignment.
- B. Apply a bead of silicone around bottom cover opening of housing and install bottom cover.
- C. Install screws (1a) using Permabond thread locking liquid as recommended in the General Service Manual.

## SEAL INSTALLATION



*Fig. 11 Seal installation*

- A. Apply EXP 222 grease to outside of seal (9, 26).
- B. Install seal around center post (7), taking care to depress it evenly so that rubber seal does not fold.

## SERVO MOTOR INSTALLATION

- A. Position clamp collar (13) on input shaft (15). The collar should be positioned so collar screw will be accessible through opening in mounting plate.
- B. Position mounting plate and servo motor on housing (1).
- C. Working through opening in mounting plate, tighten shaft collar screw (29).
- D. Install motor mounting screws (23) using Permabond thread locking liquid as recommended in the General Service Manual.

## HOW TO ORDER PARTS

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Please refer to the parts list shown in this manual. This parts list is for a standard RSD rotary servo drive. If you feel your unit is nonstandard, or you are in doubt, contact DE-STA-CO's CAMCO customer service at (847) 459-5200 and request a Bill of Material for your specific unit based on serial number. DE-STA-CO maintains records on all units for a period of 10 years.

You may order parts per the standard Parts List even if your unit is nonstandard. CAMCO's customer service representatives will review the closed order file based on the following information and supply you with the correct part.

### REQUIRED INFORMATION

1. Serial number (located on name plate)
2. Model number (located on name plate)
3. Customer name (original purchaser of drive)
4. Approximate date of purchase
5. Original purchase order number (if available)

### TO ORDER PARTS

Contact CAMCO's Order Entry Department in Wheeling, Illinois:

- Phone (847) 459-5200
- FAX (847) 459-3064

1. Describe the parts required and provide the 14-digit part number listed in the standard Bill of Material or the Special Bill of Material pertaining to your unit. Tell your customer service representative if you are using the standard or Special Bill of Material.
2. Provide as much the above required information as possible.

## WARRANTY/NON-WARRANTY INFORMATION

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### ON WARRANTY

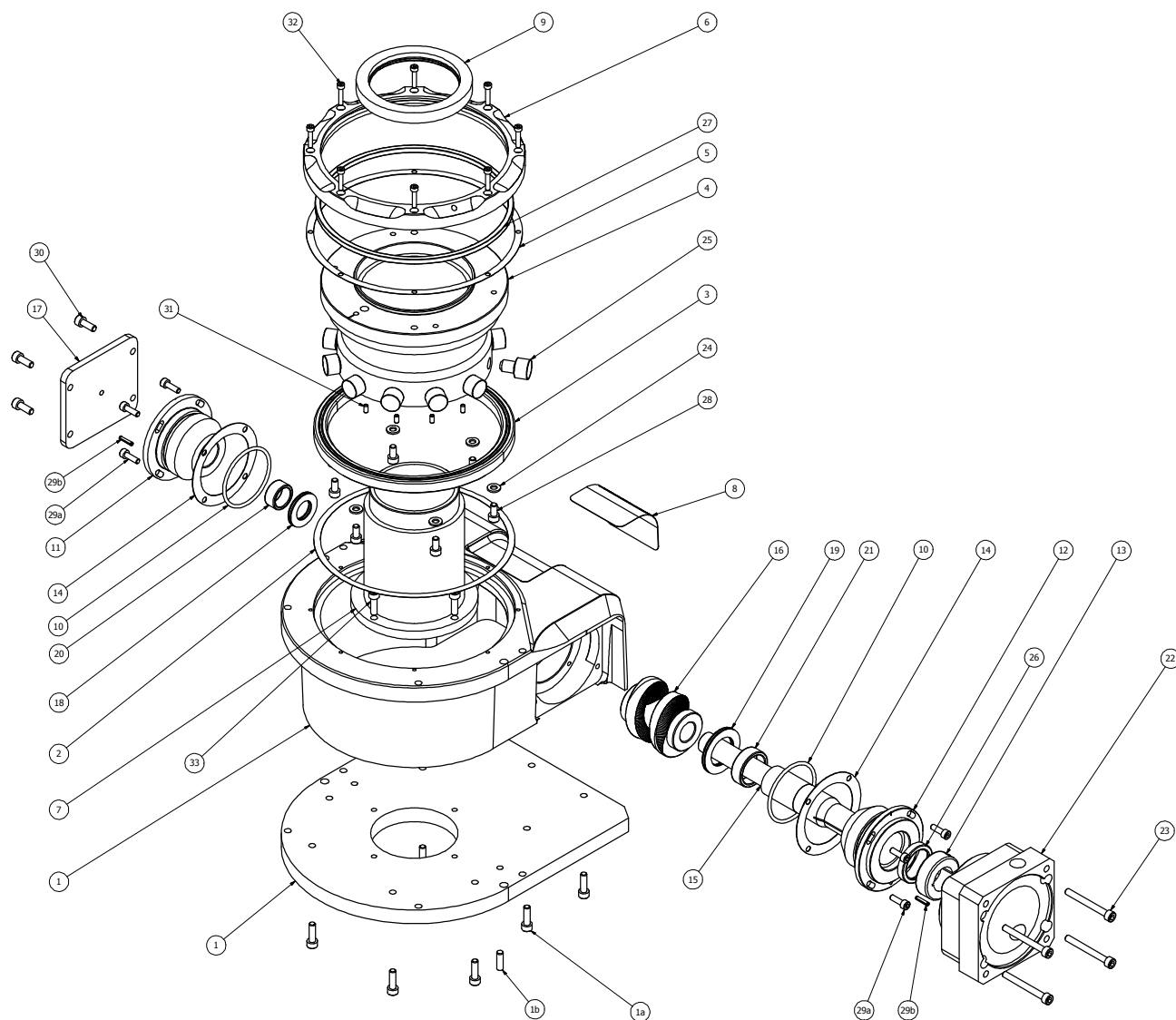
DE-STA-CO will send replacement parts freight prepaid via practical means.

DE-STA-CO will issue a returned material authorization (RMA) number for the return of defective parts for inspection. DE-STA-CO will bill the customer for repair parts. When inspection of the returned parts has been completed and determined to be a warranty problem, DE-STA-CO will issue a credit to the customer for the repair parts and freight charges.

### ON NON-WARRANTY

Replacement or spare parts, with approved credit, are sent F.O.B. to our plant in Wheeling, Illinois.

# CAMCO RSD ROTARY SERVO DRIVE – 115RSD



## 115RSD PARTS LIST

### 115RSD WITH FLANGED OUTPUT AND THRU-HOLE

<u>ITEM</u>	<u>QTY</u>	<u>PART NUMBER</u>	<u>DESCRIPTION</u>
1	1	XCD93148001002	MACH HSG ASSY, 115RSD
1a	9	95A33040190000	MSHCS M6-1 X 20L
1b	2	95A38175040000	DOWEL PIN 6mm X 20mm
2	1	XCB92193018800	SHIM, OUTP BRG .002 IN
	1	XCB92193028800	SHIM, OUTP BRG .003 IN
	1	XCB92193038800	SHIM, OUTP BRG .005 IN
	2	XCB92193048800	SHIM, OUTP BRG .010 IN
3	1	86A27251000000	OUTPUT BEARING
4	1	XCD93276014016	FLWR WHL 16H20 (FOR 4:1 CAM)
	1	XCD91947024015	FLWR WHL 15H24 (FOR 5:1 CAM)
	1	XCD91947044018	FLWR WHL 18H24 (FOR 6:1 CAM)
	1	XCD91947034016	FLWR WHL 16H24 (FOR 8:1 CAM)
	1	XCD91947044018	FLWR WHL 18H24 (FOR 9:1 CAM)
	1	XCD91947014012	FLWR WHL 12H24 (FOR 12:1 CAM)
	1	XCD91947024015	FLWR WHL 15H24 (FOR 15:1 CAM)
	1	XCD91947034016	FLWR WHL 16H24 (FOR 16:1 CAM)
	1	XCD91947044018	FLWR WHL 18H24 (FOR 18:1 CAM)
5	2	XAB75076018800	SHIM, OUTP CART .002 IN
	1	XAB75076028800	SHIM, OUTP CART .003 IN
	1	XAB75076038800	SHIM, OUTP CART .005 IN
	1	XAB75076048800	SHIM, OUTP CART .010 IN
6	1	XCC93188000000	OUTPUT BRG RETAINER
7	1	XCC91942000000	CENTER POST 115RSD
8	1	XCA93163000000	LABEL 115RSD
9	1	84C65421440000	OIL SEAL, OUTPUT
10	2	84B68148040000	O-RING, INPUT CART
11	1	XCB93165003002	CART, INP ECC CLOSED
12	1	XCC93164003002	CART, INP ECC OPEN
13	1	99A77546060000	CLAMP COLLAR MCL-25-F
14	2	XCA93202010000	SHIM, INP CART .002 IN
	2	XCA93202020000	SHIM, INP CART .003 IN
	2	XCA93202030000	SHIM, INP CART .005 IN
	2	XCA93202040000	SHIM, INP CART .010 IN
15	1	XCB93175007001	SHAFT INP SE, 115RSD
16	1	XCB93252005002	CAM MACH 115RSD 4:1
	1	XCB93255005002	CAM MACH 115RSD 5:1
	1	XCB93256005002	CAM MACH 115RSD 6:1

# 115RSD WITH FLANGED OUTPUT AND THRU-HOLE (CONTINUED)

	1	XCB93251005002	CAM MACH 115RSD 8:1
	1	XCB93257005002	CAM MACH 115RSD 9:1
	1	XCB93258005002	CAM MACH 115RSD 12:1
	1	XCB93260005002	CAM MACH 115RSD 15:1
	1	XCB91609005002	CAM MACH 115RSD 16:1
	1	XCB93261005002	CAM MACH 115RSD 18:1
17	1	XCB93189000000	CLOSED INPUT COVER
18	1	86A74373030000	INP NEEDLE BRG ASSY
	2	86A74373040000	INP THRUST WASHER
19	1	86A74373120000	INP NEEDLE BRG ASSY
	2	86A74373130000	INP THRUST WASHER
20	1	86A74372020000	INP NEEDLE BRG HK2012
21	1	86A74372070000	INP NEEDLE BRG HK3012
22	1	XCC93160000000	SERVO MTR ADAPTER
23	4	95A33040240000	MSHCS M6-1 X 45L
24	6	95A26021220000	WASHER, HARDENED 1/4
25	16	82C33150110003	CAM FLWR H20 (FOR 4:1 CAM)
	15	82C33150120003	CAM FLWR H24 (FOR 5:1 CAM)
	18	82C33150120003	CAM FLWR H24 (FOR 6:1 CAM)
	16	82C33150120003	CAM FLWR H24 (FOR 8:1 CAM)
	18	82C33150120003	CAM FLWR H24 (FOR 9:1 CAM)
	12	82C33150120003	CAM FLWR H24 (FOR 12:1 CAM)
	15	82C33150120003	CAM FLWR H24 (FOR 15:1 CAM)
	16	82C33150120003	CAM FLWR H24 (FOR 16:1 CAM)
	18	82C33150120003	CAM FLWR H24 (FOR 18:1 CAM)
26	1	84C65421080000	OIL SEAL, INPUT
27	1	84A67421830000	QUAD RING OUTPUT
28	6	95A33040170000	MSHCS M6-1 X 12L
29a	8	95A51911120000	MBHCS M5-0.8 X 16L
29b	2	95A26023250000	ROLL PIN 1/8 X 5/8
30	4	95A33040180000	MSHCS M6-1 X 16L
31	*	95A33041110000	SET SCREW M4-0.7 X 6L
32	8	95A51910330000	MSHCS M4-0.7 X 20L
33	4	95A33040190000	MSHCS M6-1 X 20L

\* Use same quantity as cam followers (Item 25)

# 115RSD EXTERNAL LOCKING ASSEMBLY 30/40MM BORE

<u>ITEM</u>	<u>QTY</u>	<u>PART NUMBER</u>	<u>DESCRIPTION</u>
1	6	95A33040170000	SHCS M6-1 X 12L
2	2	95A38175060000	DOWEL PIN 6MM X 24MM
3	1	XCC93273008910	115RSD SD ADAPTER W/30MM BORE
	1	XCC93275008910	115RSD SD ADAPTER W/40MM BORE
4	1	97A40711080000	LOCKING ASSEMBLY EXT 30MM
	1	97A40711090000	LOCKING ASSEMBLY EXT 40MM

# 115RSD INTERNAL LOCKING ASSEMBLY 30MM BORE

<u>ITEM</u>	<u>QTY</u>	<u>PART NUMBER</u>	<u>DESCRIPTION</u>
1	6	95A33040170000	SHCS M6-1 X 12L
2	2	95A38175060000	DOWEL PIN 6MM X 24MM
3	1	XCC93271000000	115RSD SD ADAPTER 30MM
4	1	97A93286010000	30X55 LOCKING ASSEMBLY



## NOTES



A **DOVER** COMPANY

**Automation**  
**Robohand *FERGUSON***  
**CAMCO**

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USA  
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Toll-free: 800-645-5200  
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